INTER PLANT STANDARD – STEEL INDUSTRY		
IPSS	**SOFT STARTER FOR VOLTAGE UP TO 690 V AC**	**IPSS: 1-10-040-15**
	NO CORRESPONDING IS	

0. FOREWORD

0.1 This interplant standard has been prepared by the Standard Committee on Electrical Components and equipment, 1:10 with the active participation of the representatives of the Steel Plants, major consultancy organizations and established manufacturers of soft starters in September 2015.

0.2 Inter plant Standard for steel industry primarily aim at achieving rationalization and unification of parts and assemblies used in steel plant equipment and accessories, and provide guidance in indenting stores or equipment (or while placing orders for additional requirement) by individual steel plants. For experience effective control on inventories, it is advisable to select a fewer number of sizes/types from those mentioned in this standard, for the purpose of company standard of individual steel plants. It is not desirable to make deviations in technical requirements.

0.3 While formulating this standard, assistance has been drawn from the following publications;

i) IEC/146-1-1 (1991-04)
ii) IEE Standard 444(Part-I):1973
iii) EN 61800-3(2nd environment) / IEC 1800-3 industrial environment.

1. SCOPE

1.1 This interplant standard covers the requirements of soft starters for medium voltage drive system.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions in IS 1885 (part 17): 1979 “Electro technical Vocabulary” shall apply.

3. SITE CONDITIONS

3.1 The following shall constitute the normal site conditions for the purpose of this standard:

3.1.1 **Ambient temperature** - The reference ambient temperature shall be 50^{o}C. Derating factors for the temperature is to be specified by the supplier.

3.1.2 **Altitude** - The altitude shall not exceed 1000m above sea level.

3.1.3 **Relative humidity** - The maximum relative humidity shall be 100%. However, the maximum ambient temperature and 100% relative humidity may not occur simultaneously. Equipment shall also withstand saline atmospheric condition.

Note: However, maximum temperature and maximum relative humidity may not occur simultaneously.

3.1.4 **Ambient air** - The ambient air may contain a fair amount of conductive & heavy dust laden steel plant environment.

3.1.5 **Noise –** Noise shall conform to IEC 61000.

3.1.6 **Vibration –** Vibration shall conform to IEC 60068-2-34.

4. ENCLOSURE

4.1 Enclosure shall also withstand saline atmospheric condition. The soft starter shall conform to IP20 and above degree of protection as per the requirement of the purchaser.

5. POWER SUPPLY SYSTEM.

5.1 The soft starter equipment shall be suitable for operation from the following power supply system.

a) *Rated Voltage*:
3 Phase 690V ac, 50 Hz
OR
3 Phase 415V ac, 50 Hz

b) *Voltage variation*: +10%, -15%

c) *Frequency variation*: 50Hz+6%, -6%

6. EQUIPMENT DETAILS

6.1 Rating

6.1.1 Soft starter should have normal power and current capacity not less than the motor rating of S1 duty, normal starting time duration(6 secs) and 12 starts/hr. The rating shall be min 120% of motor rating for fan drives. The capacity should not be 120% of the motor rating and number of starts and de-ration shall be decided on specific application.

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6.2 Soft starter system for ac drives shall mainly comprise of the following:

6.2.1 ac power circuit with antiparallel thyristors inside the soft starter.

6.2.2 Semi-conductor fuses and MCCB.before soft starter in motor power circuit

6.2.3 Control & regulation cards/equipment including protection, indication & annunciation.

6.2.4 Isolator at output of soft starter in the motor power circuit.

6.3 Basic Features required in soft starter :

6.3.1 Thyristors for soft starter shall be with microprocessor based digital regulation & control. Soft starter system regulation & control shall be compatible to PLC/ICS/DDC etc. through standard communication protocol like modbus/profibus.

6.3.2 Contactor having minimum AC3 rating equal to 1.5 times motor rated current should be provided for bypassing the soft starter after full acceleration of the motor.

6.3.3 Control logic should be in such a manner that in case of control supply failure of the soft starter during motor run mode, motor should not be tripped. A contact should be provided which can be used for generating an alarm in the purchaser’s panel.

6.3.5 Control supply voltage shall be decided on case to case basis.

6.3.6 Proper supervision of improper bridging of the contactor should be there.

6.3.7 Suitable electronic motor protection relay with display should be provided with the soft starter which will protect the motor during normal running.

6.3.9 A graphic display on the front of the device shall be there.

6.3.10 The control section of the soft starter (controller, pulse/gate drive, power supply etc.) shall be interfaced to the power section (Thyristor) with the help of screws, bus bars or flexible cables/wires and isolation of control & power section shall not require any desoldering /soldering of the components/ wires.

6.3.11 Following Control features to be added:

Starting method/modes:

i) Voltage ramp- starting time adjustable from 1sec to 30 secs.
ii) Current limit – adjustable from 2to 5 I r.
iii) Pedestal voltage – fixed voltage threshold equal to 0.8 Un.
iv) Startup booster full voltage starting over 5 cycles
v) Combined ramp & limitation for starting torque control- i.e Current limit i) To adjust the time the drive stays in current limit & ii) the choice to either switch off or continue the ramp once limit time elapses.(for high inertia & constant torque drive applications-100-500% FLC adjustable)

Stopping methods/modes

i) Soft stop- for pumps to avoid back pressure- water hammer)
ii) Free wheeling
iii) Controlled stop-Step/ramp soft stop.
iv) Voltage ramp- deceleration , adjustable from 2secs to 60 secs.
v) Closed loop linear deceleration with speed feedback- for varying loads.

6.4 **System shall have**:

□- Digital inputs: 3 Nos.

- Digital outputs 3 Nos.
- Relay O/P 2 Nos. (programmable)

- Analogue inputs: 2 Nos.
- Analogue input for motor temperature.
- Analogue output 1 No.

6.5 **Communication** – Soft starter shall have following minimum features:

RS 232

RS 485 Modbus
a) Ethernet | Optional,
b) Profibus | 25 m cable and suitable
c) Device net | connectivity

6.5.1 In case of power failure, soft starter controller shall be able to store and memorize set parameters and software blocks.

6.5.2 It shall have electromagnetic compatibility with EMC filter EN-61800-3/ IEC-1800-3.

6.6 Protection

The unit shall be capable of protecting the device (itself) and the motor both in case of faults. Class of protection shall be as per the application. Over load reset operation can be auto or manual.

Following minimum protection shall be required :

a) Protection against phase loss/phase short circuit.
b) Under voltage and over voltage protection.
c) Over temperature protection
d) Earth fault protection
e) Over load protection
f) Excessive start per hour protection
g) Phase reversal protection
h) Voltage unbalances protection.
i) Jamming detection and stall protection
j) High current or over current protection
k) Thyristor and motor over load warning
l) Under load protection
m) Display and data logging as per requirement
n) Any other protection as per purchaser’s requirement.

6.7 Alarm and Annunciation

Minimum 5 alarms for faults shall be stored preferably with the time stamping.

6.8 Metering

a) Three phase current
b) Three phase voltage
c) Power in kW
d) kWh
e) power factor of running motor
f) Motor temperature

7. PANEL FOR SOFT STARTER, SWITCHGEAR COMPONENTS AND ACCESSORIES

7.1 IP 41 and above with test certificate.

7.2 Sheet steel used for fabrication of metal cabinet for control panel shall be of cold rolled type and of thickness not less than 2 mm. Non-load bearing side may be of 1.6 mm thick sheet.

7.3 The cabinet shall be floor-mounting type and shall be provided with lockable-hinged door at front and back with handle.

7.4 The panel shall be accessible from front and back, as specified by the purchaser.

7.5 Durable gasket shall be provided for all doors and covers and for all partitions between adjacent units. The gasket shall be of sponge rubber / synthetic rubber and shall be adequately secured. Barrier shall be provided between power equipment and control equipment.

7.6 Internal control & power wiring shall be routed separately to have better noise immunity.

7.7 The control and power terminals shall be such that each and individual terminal shall be accessible for maintenance without effecting the wiring at any other terminal.

7.8 Motor data, cable length and data about ---------- ? (Members may inform)

8. TESTS

8.1 All equipment shall be fully tested in accordance with the relevant clauses of applicable standards. All components and devices shall be checked for correct operation before despatch.

8.2 Type test certificates shall be submitted for all equipment as stipulated in the relevant standards.

8.3 Routine tests as per relevant standards shall be carried out on all equipment. The test certificates shall be submitted.

8.4 Where test procedures are not specifically mentioned in the applicable standards, procedure described in IEC shall generally be followed.

(NOTE: Name of national / international standards regarding tests to be communicated by Shri Biswajit Paul to MS, as agreed in the meeting)

9. EARTHING

9.1 The earthing shall be done in accordance with the relevant provisions of the Indian Electricity Rules, 1956.

9.2 The body of each plug-in module shall be connected on separate terminal of plug to common earth bus.